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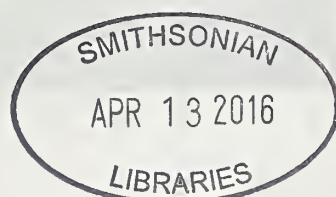
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American Association of Zoo Keepers, Inc.

The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

About the Cover

This month's cover photo comes to us from Dane Jorgensen of the Birmingham Zoo and features a mandrill (*Mandrillus sphinx*). Mandrills are the largest and most colorful of the Old World Monkey family. They are most closely related to baboons and drills. "Mandrills use their colorful rumps as communication. A brighter rump means that females are more receptive. The presenting of the rump is also a way for individuals to show submissiveness. Mandrills will also shake their head and shoulders as an invitation for grooming. Mandrills will head bob, stare, and slap the ground when showing aggression. They also use long-range and short-range vocalizations." (www.birminghamzoo.com/animal/mandrill/)

Mandrills are listed as a vulnerable species. Conservation organizations are working to protect mandrill habitat from illegal logging and the bushmeat trade. This trade has become lucrative, and, as human populations increase, it is a greater threat today than ever before. The AZA population of mandrills is managed as a Yellow SSP.

Articles sent to **Animal Keepers' Forum** will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for **AKF**. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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ANIMAL KEEPERS' FORUM

TO CONTACT THE AKF EDITOR:

Shane Good, AKF Editor
P.O. Box 535, Valley City, OH 44280
330-483-1104
shane.good@aazk.org

AAZK Administrative Office

American Association of Zoo Keepers
8476 E. Speedway Blvd.
Suite 204
Tucson, AZ 85710-1728
520-298-9688 (Phone/Fax)

CHIEF EXECUTIVE/FINANCIAL OFFICER: Ed Hansen
E-mail: Ed.Hansen@aazk.org

DIRECTOR OF PROFESSIONAL DEVELOPMENT: Bob Cisneros
E-mail: Bob.Cisneros@aazk.org

ANIMAL KEEPERS' FORUM - EDITOR

Shane Good

GRAPHIC DESIGNER

Elizabeth Thibodeaux

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Julie Hartell-DeNardo, Heather Dunn

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It is award season for the film industry as I write this. It is also award season for the American Association of Zoo Keepers (AAZK). We have nine "categories" in need of nominations. April is the final stretch for you to nominate your peers, co-workers and friends, as the **deadline is May 1, 2015**.

I know there is someone in your Chapter who should be nominated. I suggest every Chapter who hasn't met, discussed and nominated a Chapter member yet do so, before it is too late! Recognize the passion, outstanding efforts and dedication in deserving zoo keepers, aquarists and trainers!

Awards available include the Lee Houts Advancement in Enrichment, which recognizes outstanding efforts by keepers to improve animal care and welfare through environmental enrichment. The Lutz Ruhe Meritorious Achievement Award, which recognizes professional members of AAZK, for their day-to day professionalism by participation in facility-related projects or programs such as Bowling for Rhinos, conservation, wildlife education and individual breeding projects. Another is the Nico van Strien Leadership in Conservation Award recognizing an outstanding member-initiated project and personal contribution to the conservation of wildlife and their habitats, that is not the primary part of their job. There are six more awards needing nominations and you can find complete information at aazk.org.

These awards are all named after people in our field who have inspired engaging curiosity, passion and dedication. Please nominate someone deserving. Don't make them wait as long as Leonardo DiCaprio did to receive his Academy Award!

Penny Jolly
Penny.Jolly@aazk.org

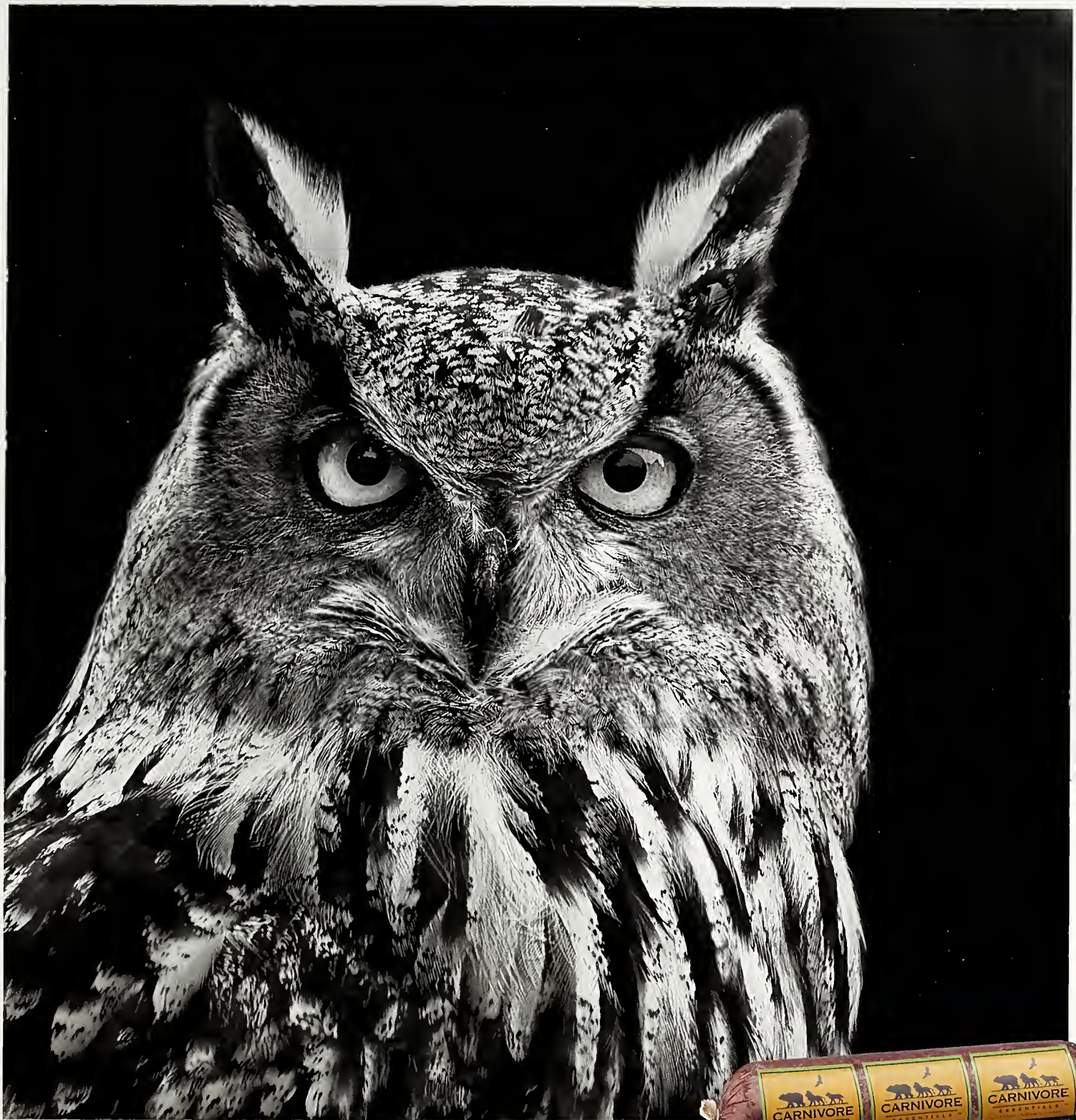
2016 Bowling for Rhinos Conservation Resource Grant

Now accepting applications!

The AAZK Conservation Committee is pleased to announce that we are now accepting applications for the Bowling For Rhinos Conservation Resource Fund for over \$11,000. The application materials and grant stipulations can be found on the AAZK website under the Bowling For Rhinos FAQ's page.

Applications are due **1 June 2016**.
Specific questions can be obtained by
contacting maryann.cisneros@aazk.org





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COMING EVENTS

Post upcoming events here!
e-mail shane.good@aazk.org

May 9-12, 2016

The International Giraffid Conference

Chicago, IL

Hosted by Brookfield Zoo

For more information go to:

<https://www.czs.org/giraffid>

May 12-17, 2016

Best Practices in Animal Keeping Course

Buffalo, NY

Hosted by AZA and Buffalo Zoo

For more information go to:

<https://www.aza.org/BPAK.aspx>

June 12-16, 2016

24th International Conference on Bear Research & Management

Anchorage, AK

International Association for Bear Research and Management

For more information go to:

www.iba2016.com

June 22-25, 2016

International Herpetological Symposium

St. Louis, MO

Hosted by Saint Louis Zoo

For more information go to the

International Herpetological

Symposium website.

August 18-20, 2016

Chimpanzees in Context

Chicago, IL

Hosted by Lincoln Park Zoo

For more information go to:

www.chimpsymposium.org/

Will precede the joint International Primatological Society congress and American Society of Primatologists meeting also at Lincoln Park Zoo.

September 7-11, 2016

AZA National Conference

San Diego, CA

Hosted by San Diego Zoo

Global and SeaWorld

San Diego

For more information go to:

www.aza.org/

annualconference/

September 25-30, 2016

International Aquarium Congress

Vancouver, BC

Hosted by The Vancouver

Aquarium Marine

Science Centre

For more information go to:

<http://iac2016.venuewest.com/>

October 1-5, 2016

Otter Keeper Workshop

Buffalo, NY

Hosted by the Buffalo Zoo

For more information go to:

www.otterkeeperworkshop.org/

October 31 - Nov. 5, 2016

2016 International Gorilla Workshop

Guadalajara, Mexico

Hosted by the Guadalajara Zoo

For more information go to:

<https://igw2016.wordpress.com/>



September 19-23, 2016

AAZK National Conference Memphis, TN

*Hosted by Memphis Zoo AAZK
Chapter and Memphis Zoo.*

MemphisZoo.org/AAZK-Conference

November 14-18, 2016

15th International Elephant & Rhino Conservation and Research Symposium

Singapore Zoo.

Hosted by Wildlife Reserves Singapore.

For more information go to:

elephantconservation.org/



2016 AAZK AWARDS NOMINATIONS OPENED

The deadline for nominations is 1 May 2016.

Information concerning the qualifications, nomination procedure, selection procedure and an explanation of the awards may be obtained at aazk.org under committees/awards.

If you have questions, please contact Janet McCoy at janet.mccoy@aazk.org.

☐ **Lifetime Achievement Award (LA)**

This award is given at the end of a keeper's career and recognizes outstanding commitment to professionalism as a zoo keeper over a long period of time, and significant contributions to the community.

☐ **The Lutz Ruhe Meritorious Achievement - AAZK Professional of the Year Award**

The award recognizes professional members of AAZK, in good standing in the Association, for their outstanding day-to day professionalism within their facility.

☐ **Jean M. Hromadka AAZK Excellence in Animal Care Award**

The award recognizes outstanding achievement and determination of an individual or team in the animal care field and in fostering professionalism.

☐ **Lee Houts Excellence in Enrichment Award (LHEE)**

The award recognizes outstanding keeper-initiated contributions to advance the art and science of environmental enrichment.

☐ **Certificate of Merit for Zoo Keeper Education (CMZE)**

The award recognizes individuals, institutions and organizations in the zoological community most actively promoting educational programs for zoo keepers.

☐ **Certificate of Excellence in Exhibit Design Renovation (CEER)**

The award recognizes institutions or organizations in the zoological community for the design and renovation of existing animal facilities which involved active keeper participation in the process.

☐ **Certificate of Merit in Conservation Award (CMC)**

The award recognizes outstanding keeper-initiated contributions to conservation of wildlife and their habitats.

☐ **Mazuri® Animal Nutrition Award (MANA)**

The award recognizes individuals in the zoological community who have been actively involved in projects/studies/research concerning zoo/aquarium nutrition.



AAZK 2016

CREATING A HARMONY WITH WILDLIFE

M E M P H I S

43rd Annual National AAZK Conference
September 19-23, 2016

Registration

Full Member Registration: \$250	\$250
Non-Member Registration: \$350	\$350
Late Full Member Registration: \$350	\$350
Late Non-Member Registration: \$375	\$375
Daily Member: \$100	\$100
Daily Non-Member: \$110	\$110
Late Daily Member: \$110	\$110
Late Daily Non-Member: \$120	\$120

Individual Event Registration (Non-Registered Parties)

Icebreaker \$35	\$35
Zoo Day \$40	\$40
Banquet \$40	\$40
Awards Luncheon \$25	\$25

Pre-Conference Trip

Sunday, September 18th

- Little Rock Zoo

Post-Conference Trip

Saturday, September 24th

- Wolf River Canoe Trip



Conference Schedule

Monday, September 19th

- ▶ Icebreaker

Tuesday, September 20th

- ▶ Opening of Conference
- ▶ Keynote Speaker: WildAid
- ▶ Papers & Workshops
- ▶ Town Hall
- ▶ Rhino Rally

Wednesday, September 21st

- ▶ Zoo Day at the Memphis Zoo!
- ▶ Silent Auction
- ▶ Poster Sessions

Thursday, September 22nd

- ▶ Papers & Workshops
- ▶ Awards Luncheon
- ▶ Beale Street Bar Crawl!

Friday, September 23rd

- ▶ Papers & Workshops
- ▶ Farewell Banquet

2016 Certification Workshops

- ▶ Carnivore
- ▶ Avian
- ▶ Animal Welfare

Chapter Challenge

The Memphis AAZK Chapter would like to invite all Chapters to participate in the 2016 National AAZK Conference, Chapter Challenge! To learn more about the Chapter Challenge and how you can donate, please e-mail aazk2016@memphiszoo.org.

Challenge Levels

Copperhead – \$250

- ▶ Chapter name listed inside the program
- ▶ Sponsor introduction/acknowledgement at one all-attendee conference event (TBD)

Fishing Cat – \$500

- ▶ Chapter name and logo listed inside the program
- ▶ Chapter name, website link and brief description (150 words) included on Conference web page
- ▶ Sponsor introduction/acknowledgement at one all-attendee conference event (TBD)

Golden White-Eye – \$1,000

- ▶ Chapter name and logo listed inside the program
- ▶ Chapter name, website link and brief description (150 words) included on Conference web page
- ▶ Sponsor introduction/acknowledgement at one all-attendee conference event (TBD)
- ▶ Chance to win a conference registration for one of your delegates!
- ▶ Opportunity to talk for 5-10 minutes about your AAZK Chapter at a Conference Event. (Event TBD)



memphiszoo.org/aazk-conference
aazk2016@memphiszoo.org

Registration is open now! So, come on down to the Birthplace of the Blues and enjoy some good old southern hospitality! Memphis 2016

Final Call for Papers

**The 43rd Annual AAZK National Conference
Memphis, TN September 19-23, 2016**

"Creating a Harmony with Wildlife"
Hosted by Memphis AAZK and the Memphis Zoo

We are pleased to host the 2016 National AAZK Conference. Our theme "Creating Harmony with Wildlife" will highlight how zoo and aquarium professionals work to advance animal care and conservation.

Papers:

Authors will be allowed 15 minutes for a presentation with five minutes of Q & A immediately following. Abstracts should focus on the conference theme including innovative approaches and best practices in the areas of husbandry, animal welfare, conservation, education, enrichment and training.

Posters:

Posters will be on display throughout the conference in the Vera Cruz C Exhibit Hall with a scheduled Q & A session with the presenter to be determined.

Deadline for Abstracts is 15 May 2016

Guidelines for Abstracts:

- ▶ Deadline for Abstracts is 15 May 2016
- ▶ Authors will be notified, regarding acceptance, by 15 June 2016
- ▶ All papers and posters (PDF or PPT slide) must be received by 20 July 2016 to be included in the conference proceedings
- ▶ Abstracts should be no more than 250 words and submitted as a Microsoft Word® document via e-mail to: pdcaazk.org

Please include the following information:

- ▶ Name of the authors and presenter
- ▶ Institution/Affiliation
- ▶ Position/Title
- ▶ Title of Work (please specify poster or paper)
- ▶ AV requirements
- ▶ Contact information (please include e-mail)

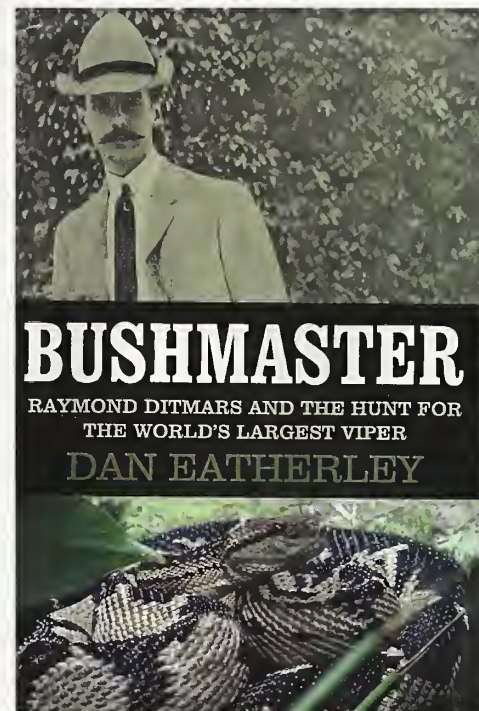


BOOK REVIEW:

Bushmaster: Raymond Ditmars and the Hunt for the World's Largest Viper

Review by Robert W. Mendyk, ¹*Supervisor of Herpetology*
Jacksonville Zoo and Gardens, Jacksonville, FL 32218 USA
²*Smithsonian Research Associate*, Department of Herpetology
Smithsonian National Zoological Park
Washington D.C., 30001 USA

*Bushmaster: Raymond Ditmars and the
Hunt for the World's Largest Viper*
Dan Eatherley. 2015.
Arcade Publishing, New York
303 pages



Among the many North American zoological institutions that have helped shape the field of zoo biology, few have played as great a contributing role as the New York Zoological Society (NYZS), known today as the Wildlife Conservation Society. A wealth of books and other historical accounts have chronicled the fascinating history of the society and its various facilities including the Bronx Zoo, as well as the careers and contributions of its early staff members to the fields of zoology and conservation biology. In particular, several important works have celebrated the Bronx Zoo's original two animal curators – William Beebe (1877-1962), curator of birds and founder of the NYZS's Department of Tropical Research, and Raymond Ditmars (1876-1942), curator of reptiles. These two men were responsible for many pioneering advancements in their respective fields, hundreds of scientific publications and popular articles on their charges at the zoo and natural history, and dozens of popular books which introduced readers of all ages to the joys and wonders of nature. Raymond Ditmars is often revered as one of the most important and influential zoo biologists and naturalists of the 20th century, and a key figure in shaping North American herpetology.

As the latest contribution to the large body of work focusing on the Bronx Zoo and its staff, Dan Eatherley's 2015 book entitled *Bushmaster: Raymond Ditmars and the Hunt for the World's Largest Viper* takes readers on an epic journey through the past and present as he recalls the life, career and travels of Raymond Ditmars and his unwavering fascination with the bushmaster (genus *Lachesis*), the largest venomous snake of the Americas. Drawing largely from previous biographical and autobiographical accounts, the author invokes an interesting narrative, jumping back and forth between Ditmars' own adventures and personal experiences and those of the author, as he attempts to reconstruct and retrace many of Ditmars' footsteps in New York City, the northeastern US, and the neotropics. With this information, the author embarks on his ultimate goal of succeeding where Ditmars did not - finding a bushmaster himself in the forests of Trinidad.

Readers will be fascinated to learn about the many pioneering techniques and advancements that Ditmars was responsible for, including the domestic production and procurement of snake antivenoms, as well as the filming and production of some of the world's first wildlife motion pictures during the 1910s and 1920s. The author also highlights Ditmars' childhood growing up in the New York City area and his attraction to snakes and other aspects of natural history from an early age, as well as the trajectory of his career from a budding teen reptile enthusiast keeping a menagerie of snakes in the attic of his parents' house, to studying insects at the American Museum of Natural History, to working as a reporter for the New York Times, and finally to his curatorial position with the zoo and adventures collecting reptiles and mammals abroad. In New York, Ditmars was hailed as a celebrity by the press, and often featured in articles chronicling his travels and zoological pursuits, personal life, and failures- such as his return from a heavily-publicized bushmaster collecting trip empty-handed.

Despite the bulk of Ditmars' personal library, memoranda, and correspondence letters apparently being lost or discarded following his death, Eatherley has done a superb job of piecing together and recalling the life and times and exploits of this important zoo figure in a manner that is inviting to all fanciers of zoo history, zoo biology and natural history- not just the herpetologically-inclined. Beyond portraying an important bygone era in zoo keeping that will be of much interest to anyone who has ever worked in a zoo, it also represents a further contribution detailing historical aspects of the Bronx Zoo and its staff, and ranks among other must-read titles on the zoo's history such as William Bridge's *Gathering of Animals* and Peter Brazaitis' *You Belong in a Zoo*. Individuals with a specialized interest in herpetology and its history will be pleased to find this book highly entertaining and deserving of a place on their bookshelves next to Ditmars' classic books as well as the works of other celebrated zoo herpetologists such as Carl Kauffeld, Roger Conant, and James Murphy.

Reid Park Zoo Lar Gibbon Exhibit Use and Activity Budget

Karen T. Wylie, Graduate Student
Reid Park Zoo, Tucson, Arizona

Abstract

Lar gibbons (*Hylobates lar*) are arboreal and diurnal apes whose native habitat is the rainforests of Asia. Reid Park Zoo is home to a family group of three lar gibbons. The current gibbon exhibit is one of the oldest in the Zoo and plans are underway to redesign and construct a new gibbon exhibit. This study collected data on whether the gibbons were spending more time on the ground or above the ground, which exhibit features the gibbons were interacting with, and their activity budget. Naturalistic zoo exhibits that provide opportunities for species to display natural behaviors are important for the well-being of the captive species; they also play a role in an educational zoo visitor experience. Exhibit design can influence species behavior and encourage captive species to display a wide variety of natural behaviors. The purpose of this study is to document the current exhibit use by the gibbons and current activity budget, enabling sound suggestions for which features should be included in the new gibbon exhibit. Results show that the lar gibbons spend considerably more time above the ground,

than on the ground floor of the exhibit. The exhibit features interacted with most were the logs, branches, exhibit fencing, and brachiating poles. The gibbons spent the majority of their time not moving, moving, allogrooming, swinging, brachiating, and vocalizing.

Introduction

Lar gibbons (*Hylobates lar*), also referred to as white-handed gibbons, are arboreal apes that live in social groups (Bartlett, 2003; Reichard, 1998; Vereecke et al., 2006). These social groups typically consist of one adult female, one adult male, and juveniles (Asensio et al., 2014; Reichard, 1998). Native habitat of lar gibbons consists of the rainforests in Asia, India, and Bangladesh (Gillespie et al., 2013; Reichard, 1998). Reid Park Zoo is home to 1.2 lar gibbons; 1.0 Billy, 0.1 Moms, and their offspring, 0.1 Lilith (Lily). Billy is estimated to have been born in 1973 at Santa Ana Zoo and came to Reid Park Zoo in 1987. Moms was wild born, with an estimated birth in 1971, and came to Reid Park Zoo from Cleveland in 1979. Billy and Moms have produced nine female offspring, including Lilith, born at Reid Park

Zoo in 1999. The current lar gibbon exhibit is one of the oldest exhibits in Reid Park Zoo and will be newly designed and relocated within the Zoo; construction is planned to begin in late 2015 and has an expected completion date within the next two years.

It is important that captive species display natural behaviors, both for the well-being of the animal, and the entertaining and educational experiences for the zoo visitor (Andersen, 1991; Benbow, 2004; Whitehead, 1995). The design and features of the exhibit can encourage these natural behaviors (Ben-Ari, 2001; Benbow, 2004; Miller et al., 2013; Whitehead, 1995; Yilmaz et al., 2010). Zoo exhibits should be naturalistic and functional; the captive species should utilize all of the exhibit space, and the exhibit should provide ample opportunities for the species to display a wide variety of natural behaviors (Yilmaz et al., 2010).

Although wild gibbons are typically found above the ground, in captivity, gibbons have been found to spend time on the ground (Esser et al., 1979; Vereecke et al., 2006). The purpose of this study is to determine what percentage of time the lar gibbons at Reid Park Zoo spend on the ground vs. above the ground. It is predicted that since lar gibbons are an arboreal species, they will spend more time above the ground. In addition to exhibit use, the gibbon activities will also be documented to determine which features in the exhibit encourage the most activity and where they are displaying natural behaviors. This data can provide a better understanding of the current exhibit features that should be included in the new lar gibbon exhibit space.

Methods

Data was collected throughout the month of October 2014 by one observer on different days of the week and at different times of day. Data was collected between the hours of 08:00-15:00, with approximately one hour of observations for each day of the week. For each observation period the day of the week, date, start time, end time, and weather was recorded. The instantaneous scan sampling

Gibbon Exhibit Exterior



method was used to collect data (Crockett & Ha, 2010). Every 60 seconds the observer indicated for each gibbon if they were on the ground or above ground, which exhibit features they were interacting with, and their activity at the time. An electronic timer was used to alert the observer to record observations at 60 second intervals. Observations were not recorded while zoo keepers were present, unless the zoo keeper presence did not appear to have an impact on the gibbons. If the gibbon presence, behavior, or the feature they were interacting with was not visible/unknown, no mark was made.

Exhibit features include a platform near the main food source, hanging loose vertical ropes, hanging horizontal ropes, a horizontal ladder, logs and branches, hammocks, rocks, brachiating poles, grass, exhibit side fencing, top of the exhibit fencing, chute, and dirt. The gibbon behaviors and activities documented were determined based on an ethogram (Palombit, 1992), suggestions by the lar gibbon zoo keeper at Reid Park Zoo, and pilot studies. Behaviors include foraging, brachiating, eating, allogrooming, personal grooming, vocalizing, swinging, hunting, moving, and not moving. Foraging is defined as searching for food or edible enrichment, hunting as searching for birds, insects, and squirrels, and eating as consuming food. Brachiating is defined as using their arms to swing from one exhibit feature to another; swinging is defined as swinging, while not moving from one exhibit feature to another. For the purposes of this study, allogrooming is defined as grooming another gibbon or being groomed by another gibbon, and self-grooming or personal grooming as grooming themselves. Moving is defined as moving by walking, climbing, or any movement other than brachiating or swinging, and not moving is defined as sitting, standing, hanging, or other form of non-movement.

Once the data collection was completed, the totals were calculated to indicate an estimated percentage of time spent on the ground and above the ground. Exhibit features the gibbons interacted with and the gibbon activities were also totaled. Totals were calculated for individual gibbons and the combined gibbon totals as a whole.

Results

The gibbons, combined and individually, spent considerably more time above the ground than on the exhibit floor. The combined estimated total of the amount of time spent on the ground or above ground for Billy, Moms, and Lily was 98% above the ground and 2% on the ground (Figure 1). Billy's individual estimated percentage of time spent above the ground was 99%, Moms spent an estimated 96% of the time above the ground, and Lily was

never recorded on the floor of the exhibit. The combined highest percentage of time the gibbons spent with any of the exhibit features was on the logs and branches on the exhibit for an estimated 25% of the time (Figure 2). The combined estimated percentage of time spent on the exhibit fencing was 23%, and an estimated 16% of the time was spent on the brachiating poles. Billy spent the highest estimated percentage of time, 43%, on the exhibit fencing. Moms spent an estimated 44% of the time on the logs and branches in the exhibit. Lily spent an estimated 22% of the time on the logs and slightly less time on the vertical ropes hanging in the exhibit. The combined majority percentage of time the gibbons spent not moving was 51% of the time. Billy spent the majority of time not moving; including resting, sitting, standing, or hanging, for an estimated 70% of time. Moms also spent the majority of the time not moving, for an estimated 52% of the time. In addition to Billy and Moms, Lily also spent more time not moving than any other activity, however only for an estimated 33% of the time. Lily spent an estimated 26% of the time allogrooming and 17% of the time swinging.

Discussion

As predicted, the gibbons spent considerably more time above the ground than on the ground. Wild gibbons rarely spend time on the ground; however, will do so for foraging opportunities and drinking (Reichard, 1998). In the two instances when drinking water was recorded in this study, the gibbon stood on the ledge of the water dish to drink; this was recorded as above the ground. It was surprising that of the time the Reid Park Zoo gibbons spent on the ground of the exhibit, only an approximate 5.26% of the time was spent foraging and 5.26% hunting (Figure 3). The remaining activities observed while the gibbons were on the ground of the exhibit were moving, not moving, and self-grooming. This may be due to the lack of predators in the Zoo setting.

Moms spent approximately 27% of the time allogrooming, most of which time she was grooming Lily; and Billy only spent approximately 1% of the time allogrooming. Allogrooming can be used for reciprocation of food, mating, and other desires (Barelli et al., 2011; Schino & Aureli, 2010), although reciprocation was not detected in this study. Allogrooming may also be a social bonding activity, which may also reduce aggression (Cooke & Schillaci, 2007; Fischer & Geissmann, 1990; Schino & Aureli, 2010). This may be why minimal aggressive behavior was observed during the study, and was never recorded on the 60 second marks. Lar gibbons typically live in pairs (Silk, 2002) without one being dominant over the other, which may also account for the lack of aggressive behavior (Barelli et al., 2008).

Figure 1: Combined Time Billy, Moms, and Lily Spent On and Above the Ground

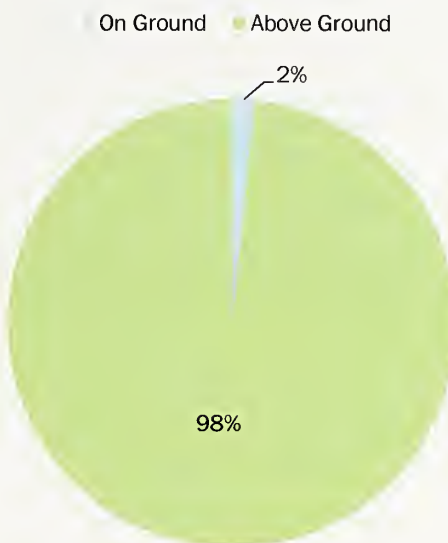


Figure 2: Combined Total Exhibit Use Percentage of Time

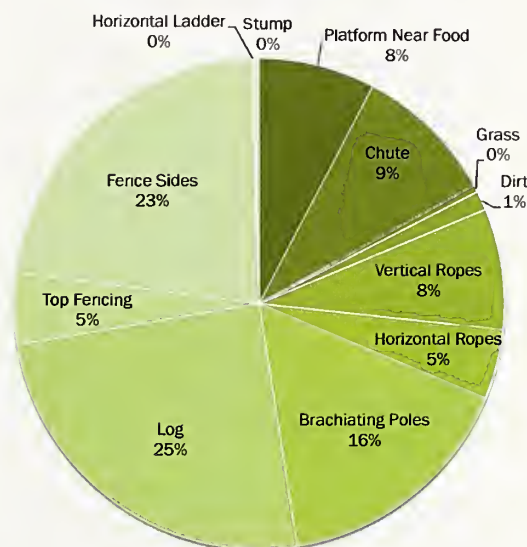
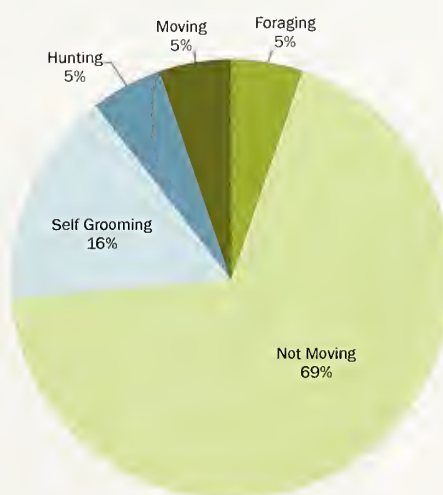


Figure 3: Combined Gibbon Activity While On Ground



Stereotypic behavior, such as pacing, excessive scratching, rocking, or highly aggressive behavior (Cooke & Schillaci, 2007) was never observed. This may be due to an appropriate exhibit size with adequate features to keep the gibbons stimulated (Cooke & Schillaci, 2007). The Reid Park Zoo gibbons spent approximately 5% of the time vocalizing, singing, or calling; these songs were observed between the hours of 08:30-09:30. This was expected, as wild gibbons are known to sing in the morning hours (Reichard, 1998). In the wild, gibbons use these songs to help defend their territory (Koda et al., 2012).

There are three hammocks in the exhibit, each made of different materials and located in different areas within the exhibit space. The gibbons were never recorded interacting with the hammocks, and only once was one of the gibbons observed on a hammock, while crossing it to approach another exhibit feature. Wild gibbons are typically found in trees, and do not build nests (Reichard, 1998), so it is not surprising that Reid Park Zoo gibbons did not interact with the nest-like hammocks in the exhibit. The gibbons were also never recorded or observed on the rocks in the exhibit. This was not unexpected, as gibbons are arboreal and spend most of the time above ground. During periods when the gibbons were near the ground, they were typically hanging from the exhibit fencing or sometimes sitting on a short tree stump. Although the rocks were not utilized by the gibbons, they create a more naturalistic appearance for the zoo visitor, which is important for zoo visitor learning opportunities and appreciation of zoos (Yilmaz et al., 2010).

The gibbons were never recorded or observed sleeping. This was not surprising because gibbons are diurnal (Reichard, 1998). Future studies might include observations of the 24 hour period to give a more complete analysis of the activity budget and exhibit use. The 24 hour observation period could also provide an opportunity to include the gibbon night house use in the study.

Future studies might also be digitally recorded without an observer present. Subjectively, the observer did not appear to have any impact on the gibbon behavior, but may have had an impact on the zoo visitor behavior. Zoo visitors have been observed outside of this study feeding the gibbons when zoo staff members and volunteers are not visible to the visitor. The presence of a data collector at the exhibit might deter zoo visitors from feeding the gibbons. The gibbons were recorded spending time on the exhibit fencing more than any other exhibit feature, other than the logs and branches. Of the time spent on the exhibit fencing, an estimated 68% of that time was spent not



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moving (Figure 14). This may be in part due to previous zoo visitors feeding the gibbons through the fencing.

In total, the gibbons were observed displaying natural behaviors and utilizing most of their exhibit space. Future studies could include recording the specific areas of the exhibit that are utilized, as well as at which levels of the exhibit they spend their time, as opposed to only observing whether the gibbons were on the ground or above the ground level of the exhibit. Data documenting the area of the exhibit where the gibbons spend most of their time may also provide a better idea of what makes certain features more appealing than others. For example, knowing which of the four sides of the exhibit fencing the gibbons interacted with may provide an understanding of their motivations. It would also be beneficial to record the specific exhibit features the gibbons interacted with, including the specific logs, ropes, and brachiating poles. Recording which specific individual exhibit feature utilized would give a better idea of how often the gibbons were moving throughout the exhibit. In this study, the gibbons were often moving from one log to another log, so the movement was not indicated in the data.

Conclusion

The lar gibbons at Reid Park Zoo spend considerably more of their time above the ground than on the ground floor of the exhibit. Ample opportunities for the gibbons to be above ground in their new exhibit should be provided. The gibbons spent the majority of the time on the logs and branches in the exhibit,

which indicates that these features should be included in the newly constructed exhibit. Opportunities for gibbons to display natural and active behaviors, such as brachiating and swinging should also be included in the new exhibit, including brachiating poles and loose hanging ropes. This will be beneficial for the gibbons' well-being, as well as zoo visitor experience (Andersen, 1991; Benbow, 2004; Whitehead, 1995).

The gibbons also spent an approximate 23% of the time on the exhibit fencing. The current exhibit fencing is difficult to see through and in poor condition, and allows for zoo visitors to easily provide food to the gibbons without permission from the Reid Park Zoo staff. An appealing exhibit is important for zoo visitor perceptions of zoos (Yilmaz et al., 2010), and therefore, alternative enclosure materials for the front of the exhibit may be more beneficial to the gibbons and zoo visitors.

Based on this study, hammocks should not be included in the newly constructed exhibit space. They are not natural in appearance and are not utilized by gibbons. Providing more logs and branches in place of the hammocks may be a better use of space. Although the rocks in the exhibit were not utilized by the gibbons, they give the exhibit a more natural appearance and because of their location on the exhibit floor, they do not take up space that would otherwise be utilized by the gibbons.

The gibbons currently utilize most of their exhibit space, they are active, and they display a wide range of natural behaviors. The gibbons are also not displaying many aggressive or stereotypic behaviors. The newly constructed exhibit should mimic many of the current exhibit features, while providing a more attractive and more naturalistic appearance, as well as additional opportunities for the gibbons to display natural behaviors.

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Gibbon Exhibit Interior



Social Immersion vs. Isolation for Hand-reared Goeldi's Monkeys (*Callimico goeldii*): A Comparison of Long-Term Trends for Socialization Milestones

Vince Sodaro
Lead Keeper, Primate Department
Chicago Zoological Society/ Brookfield Zoo

Abstract

Between 1979 and 1989 fourteen Goeldi's monkeys (*Callimico goeldii*) were hand-reared at Brookfield Zoo in isolation from conspecifics for the first six weeks of life prior to reintroduction to family groups. A variety of socialization problems occurred with several of these individuals upon reintroduction as well as later on in life. A new method of hand-rearing was developed in 1991 that significantly reduced the social isolation that had characterized the first 14 hand-rearing efforts. As of 2014, this method had been used to hand-rear 12 callimico. The effects of the revised method on socialization milestones of these individuals are compared to those of the first 14 individuals. These milestones included: 1.) Percentages of hand-reared infants carried by conspecifics upon introduction to social groups; 2.) Percentages of hand-reared individuals that carried subsequent infants born into the groups in which they lived; 3.) Success rates at raising offspring by hand-reared females that were allowed to breed; 4.) Percentages of hand-reared individuals that exhibited incompatibility with conspecifics following sexual maturity. A significantly higher number of the individuals hand-reared with the revised method were carried by conspecifics upon reintroduction to their families. Because not all individuals had later opportunities to carry younger siblings or to reproduce and raise offspring, the sample sizes for these milestones remain too small to be statistically significant.

Introduction

The negative effects of hand-rearing on the behavior and proper social development of callitrichids are well-documented (Beck et al., 1982; Kuster, 1978; Pook, 1978b; Sodaro et al., 1994). These effects may include failure to properly integrate into social groups, incompatibility with conspecifics, imprinting on humans, and poor parental skills which in turn result in infant-rejection and the need for further hand-rearing. Such effects can be especially acute for individuals even when cared

for in hand-rearing situations for relatively short periods of time prior to reintroduction to natal or other social groups.

Brookfield Zoo has maintained a successful breeding colony of Goeldi's monkeys (*Callimico goeldii*) since 1977 (Beck et al., 1982). Since then 258 viable births have occurred in this colony (Warneke, 2015), the majority of which have been parent-reared in social groups consisting of a breeding pair and up to five offspring. Although every effort is made

to ensure that infants will be parent-reared, a variety of situations have occasionally necessitated hand-rearing. Inadequate maternal care by primiparous females, actual rejection of infants by females that were themselves hand-reared, illness on the part of the dam, and weakness and/or poor nursing responses by infants have all created situations that required hand-rearing. Between 1979 and 1989 fourteen infants were hand-reared using methods that had been developed at the Department of Microbiology, Rush-Presbyterian-St. Luke's Medical Center in Chicago, Illinois (Ogden, 1979). Most of these 14 individuals exhibited behavioral and socialization



problems upon reintroduction to social groups as well as later on in life (Table I). These socialization problems included: 1.) Failure to be carried by other group members upon reintroduction with a simultaneous fear by the infants of the conspecifics to which they were introduced; 2.) Failure to carry subsequent infants that were born into the groups to which the hand-reared infants were introduced; 3.) Poor maternal skills of hand-reared females that were eventually allowed to breed; and 4.) Incompatibility with conspecifics following sexual maturity.

In 1991, in response to the poor outcomes of the majority of these earliest hand-rearing attempts, the staff of the Primate Department worked to develop a "social immersion" hand-rearing protocol that would significantly reduce the social isolation of infants during hand-rearing that had characterized the original hand-rearing process (Sodaro et al.,

1994). Since the development and implementation of this method, twelve additional infants have been hand-reared with promising outcomes. This paper describes the results of these later hand-rearing efforts and compares them with the results of the first fourteen hand-rearing efforts as measured by 1.) Percentage of hand-reared infants carried by conspecifics upon introduction to social groups; 2.) Percentage of hand-reared individuals that carried subsequent infants born into the groups in which they lived; 3.) Success rates at raising offspring by hand-reared females that were allowed to breed; 4.) Percentage of hand-reared individuals that exhibited incompatibility with conspecifics following sexual maturity.

Methods

Original Hand-rearing Protocol

The first fourteen infants that were hand-reared were provided with plush toy surrogates to cling to and housed in Isolette™ human infant incubators until forty-one days of age. Incubators were located in office areas outside of the holding areas in which the enclosures were located, providing no visual contact between infants and conspecifics and limited auditory and olfactory contact. Feedings and other aspects of the care of the infants also occurred in the office space which housed the incubators. At forty-one days of age infants were transferred to small vinyl-coated wire mesh interim cages that were put into the enclosures of the groups to which they would be introduced. This step of the process provided the first actual visual, auditory, and olfactory contact between the infants and other group members. At 46-49 days of age, infants were allowed to leave the interim cage to be in direct contact with group members for the first time. The last nine of these hand-reared infants were not returned to their natal groups but were introduced to foster groups in hopes that they might have better opportunities to obtain infant-carrying experience through subsequent births.

Revised Hand-rearing Protocol

Beginning in 1991 and continuing to the present, infants have been returned to their natal groups. This approach has provided the dams of these infants valuable exposure to and experience with infants prior to subsequent births. All aspects of any situation in which hand-rearing is deemed necessary have focused on promoting as close contact as is possible between infants and family members beginning on the first day of the infant's life and continuing throughout the hand-rearing process. To minimize the likelihood of infants becoming imprinted on humans, every effort is made to minimize contact with and handling of infants by caregivers. As in the original hand-rearing process, infants are provided with plush toy surrogates. Rather than having incubators located in areas that are isolated from the groups to which the infants will be introduced, the incubators in which infants are housed are put directly into the enclosure of the infant's natal group the day the infant is born. Enclosures are 8'6" wide X 8'7" deep x 8'10" high. All are furnished with natural branches as well as shelves at the back, sides and front of the enclosures. While infants had previously been kept in incubators until the age of forty-one days, Dronzek et al. (1986) found that cottontop tamarins (*Saguinus oedipus*) could thermoregulate at ages ranging from 21-28 days. Based on these findings, beginning in 1991 all hand-reared callimico infants have been removed from incubators at 25 days of age and housed in howdy cages with supplemental heating being provided by heat lamps positioned outside of the enclosure. In so doing, infants and group members are put into closer visual, auditory, and olfactory contact with each other a full 15 days earlier than had occurred in the first 14 hand-rearing cases.

Feeding Method for Revised Hand-rearing Protocol

All feedings of infants are done inside of the enclosure of the group to which the infant will be introduced at a shelf near the front of the enclosure in the same area in which the group's meals are normally offered. At the beginning of each bottle feeding of the infant, favored

Table I. Social and Behavioral Effects of Hand-rearing on the First 14 Callimico Following Reintroduction

Reintroduction	
Carried by Group Members	2/14 (14%)
Carries Sibling	3/7 (42%)
(Female Only) Raises Offspring	2/5 (40%)
(Female Only) Rejects Offspring	4/5 (80%)

food items of the group are put into food bowls within 12" of the infant. This creates a mutually positive association for group members and the infant with each other as well as with the feeding process in general. Group members as well as the infant develop an association with each other's close proximity and being fed. During the process of feeding the infant, as well as for several minutes afterwards, group members are allowed to closely approach, sniff, touch, and groom the infant. Thus, all human/infant interactions are balanced by the simultaneous presence of conspecifics from their family group. A common behavioral pattern that has been observed during the handling and feeding of infants in close proximity to members of the family group has been the elicitation of defensive and protective behaviors directed at caregivers by the parents.

Transferring of Infant from Incubator to Interim Cage for Revised Hand-rearing Protocol

As previously mentioned, at the age of 25 days infants are removed from incubators and housed in interim cages constructed of 1" x 1/2" vinyl-coated steel mesh. Interim cages measure 12" x 14"x 18". The interim cage is placed on the same shelf on which the group's meals are offered. The close proximity of the cage to the feeding area of the main enclosure assists in the process whereby infants learn to feed themselves. This location also increases the frequency with which group members and infants are in close proximity to each other.

Reintroduction of Infants

Infants are not reintroduced directly to their family groups until they are capable of independent locomotion. Infants that are introduced prior to reaching this milestone cannot be reliably retrieved for feeding if being carried by group members. Callimico infants do not usually begin to locomote independently until the age of 35-40 days (Pook, 1978a). Infants are therefore not given direct access to other group members until 42-45 days of age. Although in the earliest of these cases infants were generally allowed to leave the interim cage to become integrated into their family group at their own pace, Primate Department staff have since taken active steps to increase the likelihood that infants will be carried by other group members. These have included 1.) Shutting infants out of the interim cage and the removal of surrogates at the end of the day to encourage infants to begin sleeping with and on group members overnight; 2.) Placing the infant directly onto the back of a stationary group member; 3.) Removal of infant from its surrogate and "stranding" it on a branch or other substrate in the enclosure to encourage group members to approach and "rescue" the infant.

Results

All twelve of the infants that were hand-reared using the revised protocol were carried by other group members upon reintroduction (Table II). The ages at which infants were first carried by group members ranged from 42-64 days with an average age of 47.5 days. Three of these twelve infants had later opportunities to carry younger siblings and all three of them carried siblings normally (Table II).

Three females that were hand-reared using the revised protocol were allowed to breed as adults (Table II). The first of these three successfully reared two offspring. The second of these females successfully reared one infant and rejected one infant which was subsequently hand-reared.

Table II. Socialization Milestones for Brookfield Zoo Callimico Hand-reared Using Revised Method 1991-2014

Name/STD#	Carried?	Carries Siblings	♀ Raises Offspring	♀ Rejects Offspring	Compatible w/ Conspecifics
Hazel ♀ / 1071	Yes	No Opp	No Opp	No Opp	Yes
Terry ♂ / 1413	Yes	Yes			Yes
Sherman ♂ / 1468	Yes	No Opp			Yes
Leila ♀ / 1991	Yes	Yes	Yes (2)	No	Yes
Gracie ♀ / 2067	Yes	Yes	Yes (1)	Yes (1)	Yes
Noodle ♀ / 2225	Yes	No Opp	No Opp	No Opp	Yes
Gabby ♀ / 2429	Yes	No Opp	Yes (3)	Yes (1)	Yes
Sharky ♂ / 2640	Yes	No Opp			No
Monita ♀ / 2795	Yes	No Opp	No Opp	No Opp	Yes
Yara ♀ / 2935	Yes	No Opp	No Opp	No Opp	Yes
Lolita ♀ / 3015	Yes	No Opp	No Opp*		Yes
Peluche ♀ / 3243	Yes	No Opp*			
Totals	12/12: 100%	3/3: 100%	3/3: 100%	2/3: 66%	10/11: 91%

*No opportunity as of May 2015

This hand-reared infant, also a female, later raised three offspring and rejected a fourth which also required hand-rearing. Only 1 of the 12 infants that were hand-reared with the revised protocol demonstrated incompatibility with conspecifics following sexual maturity (Table II).

Although not included in the results of this study, one male callimico and one female callimico infant were also hand-reared at other institutions using the revised method after close communication with Brookfield Zoo Primate Department staff. The male was carried by his mother following reintroduction but as an adult proved to be incompatible with conspecifics and was consequently unable to breed and reproduce. The female that was hand-reared using this method had a normal social development and subsequently reproduced and successfully raised six offspring.

Discussion

The frequency with which callitrichid infants that are hand-reared in isolation from conspecifics fail to be carried by group members upon reintroduction demonstrates the fragility and complexity of the bonding and socialization process that occurs between infants and group members when infants are parent-reared in normal social groups. Whether or not a hand-reared infant is carried upon reintroduction therefore represents the first and perhaps most critical milestone to indicate if the hand-rearing process has provided sufficient opportunities for socialization and bonding between the infant and its family.

Fear of conspecifics by infants that have been hand-reared in social isolation prior to reintroduction is common (Kuster, 1978; Pook, 1974). Carrying of infants is dependent on a set of consensual interactions in which a.) The infant perceives other members of the social group as familiar sources of comfort and security and approaches them to be carried; and b.) Other group members are receptive to the infant's approaches and attempts to climb onto their backs and into a normal dorsal infant-carrying position. Such a scenario is highly unlikely to occur unless a mutual bond has been developed through constant exposure and close contact between infants and group members throughout the hand-rearing process. The fact that all twelve of the callimico infants that were hand-reared with the revised protocol were carried upon reintroduction offers convincing evidence that a normal bond between the infant and family members was able to develop and be maintained throughout the hand-rearing process.

Carrying of younger siblings by older offspring raised in family groups is a hallmark of the social structure of all genera of callitrichids, including Callimico (Stevenson and Rylands, 1988; Kleiman, 1977; Snowdon et al., 1985; Soini, 1988; Porter and Garber, 2004). However, aversion to the carrying of younger siblings occurred for four of seven callimico that were hand-reared using the original protocol. This aversion was in some cases quite pronounced with hand-reared individuals observed frantically and forcibly attempting to dislodge infants that had climbed onto their backs.

Established breeding pairs of callimico reproduce at inter-birth intervals of approximately 165 days. The dam is normally the exclusive carrier of newborn infants until infants are in their fourth week of life. Thereafter the sire and any older offspring in the group begin to carry and assist in the care of the infant. Such a scenario will usually provide juvenile callimico with their first opportunity to carry a younger sibling at approximately 6-7 months of age. The aversion to carrying of younger siblings by several of the first 14 hand-reared individuals again demonstrates a breakdown in the normal socialization process that occurs for individuals that are reared in normal social groups.

One of the additional benefits of the revised hand-rearing method has been the opportunity for exposure to, and experience with infants for some of the primiparous females whose infants required hand-rearing. In four of these cases (dams of stdbk#'s 1991, 2067, 2640, and 3243) the primiparous dams carried their infants following reintroduction. Two of these females had later opportunities to breed and successfully raised all subsequent offspring.

Bottle feeding infant with dam



The ages at which hand-reared callitrichid infants can skillfully locomote on their own represent the earliest ages at which they can be safely reintroduced directly to group members. Infants that are too young to locomote independently cannot voluntarily dismount from a stationary carrier and thus, cannot be reliably retrieved from carriers for feeding. However, three of the callimico infants (stdbk#s 2429, 2640, and 3243) that were hand-reared at Brookfield Zoo using the revised method were reintroduced to their families at ages at which the infants were not yet proficient at dismounting from carriers to approach caretakers for scheduled keepers. In each of these cases caretakers were able to offer and feed the infants formula via small bottles while the infants clung to the backs of their parents.

No hand-rearing effort can be considered truly successful unless the hand-reared individual is ultimately paired for breeding, reproduces, and successfully rears its own offspring. This is especially crucial for female callimico, which are normally the exclusive caregivers and carriers of infants for the first three weeks in the life of the infant.

The long-term management problems associated with hand-reared callitrichids are now so well-recognized that some AZA Species Survival Plan® captive breeding programs strongly discourage hand-rearing and have policies of exclusion of hand-reared individuals from managed breeding populations. This is the case for both the Golden Lion Tamarin (*Leontopithecus rosalia*) (Ballou and Mickelberg, 2012) and the Cottontop Tamarin (*Saguinus Oedipus*) SSP® (Savage, 1995). Institutions that find themselves in a potential hand-rearing situation for

Table III. Comparison of Socialization Milestones for Callimico Hand-reared with Two Different Protocols

PROTOCOLS

Milestones	Original Protocol	Revised Protocol
Carried by group members following reintroduction	2 (N=14) 16%	12 (N=12) 100%
Carried younger siblings	3 (N=7) 42%	3 (N=3) 100%
(Female Only) Raised Offspring	2 (N=5) 40%	3 (N=3) 100%
(Female Only) Rejects Offspring	4 (N=5) 80%	2 (N=3) 66%
Incompatibility with Conspecifics	2 (N=14) 16%	1 (N=12) 8%

other species should therefore give serious consideration to any decision to hand-rear. The probability is great that infants reared in isolation from conspecifics will have socialization problems upon reintroduction to family groups, as well as later on in life. All hand-rearing endeavors should focus on promoting as close contact as is possible between infants and their families throughout the process.

Brookfield Zoo's revised hand-rearing protocol has yielded some promising results in terms of the level of socialization that it provides to callimico infants. However, these results should not be interpreted as an endorsement of hand-rearing as a general practice but as a starting point for further refinements to the protocol for other institutions that may be considering hand-rearing. Whether or not this protocol would be successful for other genera of callitrichids remains unknown.

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Infant being bottle fed on sire's back



COORDINATORS: Casey Plummer, Caldwell Zoo • Heather Dunn, The Environmental Center Miami, Florida • Julie Hartell-Denardo, St. Louis Zoo • Dawn Neptune, Hogle Zoo

Creating Companions for Singly-Housed Primates

Jillian Rutherford, Student Zoo Keeper
America's Teaching Zoo at Moorpark College
Moorpark, California
Rutherford.jillian@gmail.com

Introduction

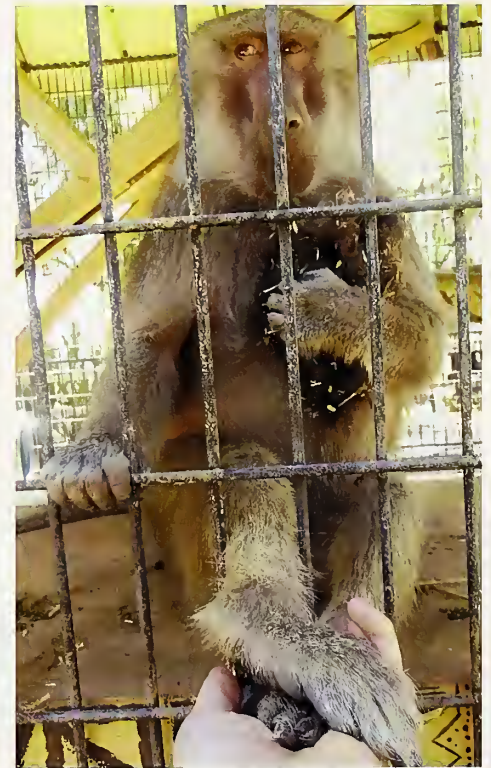
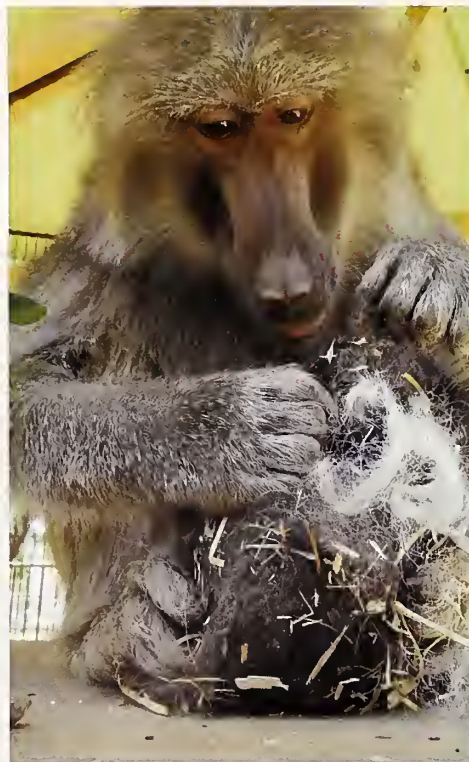
Caring for singly-housed primates is often an exercise in combatting stereotypy, especially in species that have naturally robust social lives. America's Teaching Zoo is currently home to twelve singly-housed primates. These individuals do not live with conspecifics for a variety of individual reasons, including poor social history, medical needs, age, or death of a cage-mate. It is the aim of America's Teaching Zoo to house primates socially whenever possible, and several introduction processes are currently underway. In the meantime, every effort is made to provide an enriched, complex environment for these individuals. One of these individuals is an adult female hamadryas baboon (*Papio hamadryas*). This individual displays several stereotypic behaviors including pacing, tongue rolling, motor stereotypies and regurgitation/reingestion. Eighty hours of behavioral observations were conducted

between November 2014 and March 2015 in order to evaluate the subject's behavioral repertoire and gather information relevant to forming an enrichment plan. Data collected during observations revealed that the observed animal frequently carried out pseudo-social behavior with toys in her enclosure. This included pushing them together in mock interactions, presenting her rear to the larger ones, and attempting to groom them. Keepers provide enrichment opportunities throughout the day; however, these items are limited to hard plastic, durable rubber, or cardboard and paper due to her extreme displays of strength and aggression. With some exceptions, they generally hold her attention for less than twenty minutes. The goal of providing the subject with enrichment that could better occupy her time and satisfy her social needs was created, and an object was designed

to approximate a natural social companion, allowing her to perform associated social behaviors such as grooming.

Materials and Methods

Considering the risk of ingestion and potential toxicity of foreign substances, it was decided that natural hair would be the most appropriate construction material. Wool from the recently sheared llamas and sheep at America's Teaching Zoo was collected. This provided a large quantity of cost-free, disease-free material from known origins, which was approved by the veterinary team and behavioral enrichment coordinator. The unwashed wool was picked free from hay and bedding and then rolled into a walnut-sized ball. It was felted together using a felting needle, which involved stabbing the ball repeatedly with the needle to bind the hairs together. This initial



stage required the most time and technique. Alternatively, this initial stage can be completed using the soap-and-hot-water method of felting easily available online. Once the ball became densely felted, the additional stages progressed quickly. Layers of wool were felted upon the ball, one over the other, to create a form approximately five inches in diameter. Features such as a head, ears, and face were then added using different colors of wool. The entire process took several days to complete.

Results

The finished product was presented to the subject, and her initial reaction was disinterest; she sniffed it briefly, tested its strength, and then largely ignored it for fifteen minutes. During this time the ball became covered in straw fragments, and this appears to have increased its enrichment value. Once the item's grooming properties were discovered, the subject became intensely attentive to the ball and groomed it energetically for the next three hours. Throughout this time period she lip-smacked, play-grumbled, rubbed it against her belly and carried it close to her chest throughout the enclosure, pausing to groom it periodically. She was observed to remain in close proximity to the ball for the next eight days, grooming it, carrying it, and

sleeping with it. Surprisingly, the introduction of this item did not increase possessiveness or defensive threat displays towards her trainers. On the contrary, submissive rear-presenting behavior and solicitations for grooming increased. On the ninth day, the ball was removed from her enclosure to be mended, and was returned to her six days later. Her reaction was to immediately pick up and cradle the ball for several minutes before grooming it and carrying it against her chest for the rest of the day. The intensity of this display of species-appropriate social behavior met and exceeded the predicted outcome and goal of this enrichment device.

The success of this venture spread to other singly-housed primates at the zoo. A tutorial was provided for students interested in making these enrichment devices for their assigned primates, and the finished products were delivered several days later. A hand-reared, singly-housed siamang was observed carrying her ball with her feet while swinging around her enclosure, and grooming it; a behavior never before witnessed in this individual.

Only one complication has arisen with this enrichment to date. The intensity of the subject's attachment to the item interfered

with performance of some requested behaviors during early training sessions. She refused to present both hands or her chest while clutching tightly to the ball, and instead assumed a more defensive position while offering other behaviors. These refusals subsided on the fourth day, and have not recurred.

Conclusions

Meeting the social needs of singly-housed primates is difficult and time-consuming for caregivers, and traditional enrichment methods often focus on occupying the individual with alternative behaviors instead of supporting opportunities for pseudo-social behavior. The enrichment item described in this article is a cost-effective, simple, and easily implemented way to combat stereotypy in these animals.

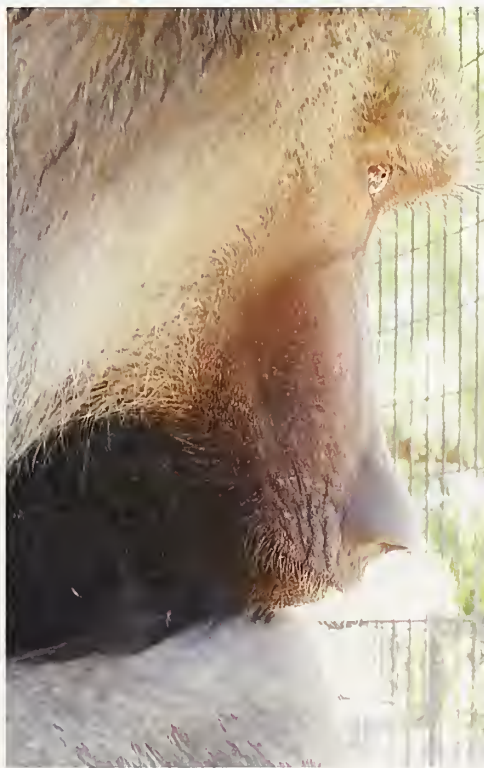
Acknowledgements

Thank you to the staff and students at America's Teaching Zoo for showing support for the "hair-ball" project, but thank you most of all to hamadryas baboon, "Nyani," for teaching me the value of perseverance by providing endless sources of inspiration and challenge. 🐒

Editor's Comments

By Dawn Neptune

What an exceptional article outlining the perfect blend of art and science to tackle an obviously challenging situation! We can all agree that providing species-appropriate social groupings to meet the complex behavioral needs of primates is a priority, but in a zoo setting, it is occasionally necessary to think more creatively to provide singly-housed animals with suitable alternative social outlets. The author makes an excellent point regarding how traditional enrichment methods did not provide for those targeted social interactions. This emphasizes the point, and reminds us all, that daily enrichment should be selected with very specific behavioral objectives in mind. Are the goals aimed at extending foraging time? Increasing challenge? Promoting object manipulation and play? Enhancing the environment? Like those of the staff at America's Teaching Zoo, our behavioral goals should be based on the needs of the species and the individual, so hats off to the staff for being proactive in recognizing and implementing an enrichment initiative with such a strong goal in mind. I was particularly impressed that the initiative was tested with some 80 hours of behavioral observation to better gauge whether the goal was being addressed, as no one enrichment provision can be considered a "one size fits all" solution. It is exciting to see that the "hair ball" device was a successful outlet for grooming and social comfort, and it effectively redirected undesired behaviors. I might also suggest adding to your arsenal by considering the application of other primate-appropriate sensory social outlets as well, such as visuals (nearby conspecifics, mirrors, stuffed animals), olfactory (shared/scented textiles, substrates, objects), and auditory stimuli (recorded affiliative vocalizations). Thank you for sharing; congratulations on your perseverance, and good luck on those introduction efforts!



Lewa Wildlife Conservancy

By Bill Konstant

Since the inception of AAZK's Bowling for Rhinos initiative more than 25 years ago, its annual fundraising events have supported Kenya's Lewa Wildlife Conservancy, which was added to UNESCO's Mount Kenya World Heritage Site in 2013 and is proud to be on the International Union for the Conservation of Nature's Green List of successful protected areas. Established initially as Ngare Sergoi in 1983 by Anna Merz, David Craig and his son Ian to protect Africa's critically endangered black rhinos, the sanctuary was renamed Lewa in 1995. The Conservancy is the founding member of the Northern Rangelands Trust, a community-based partnership that focuses on wildlife conservation and the livelihoods of nomadic pastoralists in northern Kenya. As a result of the Trusts' programs, the area under integrated conservation management in this region has grown from 5,000 km² to 25,000 km² - roughly three times the size of Yellowstone National Park - with an ultimate goal for expansion of 35,000 km² - larger than the state of Indiana. Lewa is also a founding member of the Ol Pejeta Conservancy, which ranks as East Africa's largest black rhino sanctuary and is home to the last three northern white rhinos on the planet.

Starting with 15 animals back in the 1980s, Lewa's black rhinos now number more than 70 and represent more than 10% of the species' population in Kenya. However, international poaching gangs remain a serious threat to Lewa's rhinos, so recent efforts have been made to translocate some individuals to adjoining areas where rhinos formerly occurred and can now be more effectively protected. Three years ago, 11 black rhinos were reintroduced to the neighboring Borana Conservancy. The connected Lewa-Borana landscape provides close to 100,000 acres of prime habitat for black rhinos and other threatened wildlife such as white rhinos (which was introduced to Kenya to help save the species), elephants, hippos, lions, Grevy's zebras, African wild dogs, cheetah, martial eagles, secretary birds, crowned cranes and at least five species of vultures.

Field monitors are Lewa's eyes and ears on the ground. They begin work at dawn armed with binoculars and radios, and alert armed rangers

- Kenya police reservists - regarding any emergencies or unusual sightings. It's important to note that Lewa's anti-poaching units not only ensure the safety of resident rhinos, but also improve security for local communities, in which they frequently arrest poachers for stealing livestock - cattle, camels, sheep and goats.

According to Edward Ndiritu, Lewa's Head of Anti-Poaching, "We have been able to protect all our rhinos from poachers since December 2013, but that does not mean we can now relax, not even a little. The threat to rhino and elephant in Kenya has not waned, and as long as this remains the case, we cannot afford to be anything than efficient, vigilant and innovative." Approximately 150 men and women are employed to protect Lewa's 130 rhinos, their success based in many ways on a strong working relationship with local communities, according to John Pameri, Head of General Security. Staff morale is also key to the success of anti-poaching efforts, with newly-upgraded housing facilities for rangers paying big dividends in terms of performance. As field ranger Francis Kobia is proud to say, "The provision of the new amenities has greatly improved the morale of the team. Everybody is happy with the great standards of living we enjoy, and it makes us motivated to continue working for Lewa and protecting wildlife."

In 2015, Lewa, the Northern Rangelands Trust and the Kenya Wildlife Service embarked on a program to relocate black rhinos to a sanctuary owned and operated by the Sera Community Conservancy in Samburu County. Poachers killed the last rhino in this region decades ago. Ten of the 20 animals selected for reintroduction from Lewa, Nakuru National Park and Nairobi National Park have been moved thus far, and all of the translocated rhinos will be fitted with satellite-based transmitters for monitoring purposes. Rangers from local communities have been trained in data gathering, anti-poaching operations, bush craft and effective patrolling, and can count on Lewa, Northern Rangelands Trust and Kenya Wildlife Service anti-poaching units for back-up. At least two US zoos - San Diego and St. Louis - are directly supporting this initiative. 🐆

Lewa Wildlife Conservancy is supported by Bowling for Rhinos.

Photo by Jim Haigwood



So much more than rhinos - Bowling for Rhinos supports many endangered species. Photo by Patty Pearthree.



Opening the Discussion for Ethics on the Ark

Pattie Beaven and Beth Ament Briggs
Behavioral Husbandry Committee

When I picked up my first copy of “Ethics on the Ark” in 2003, I was relatively new in the field. I attended a conference where I heard some incredible insights on environmental enrichment and training and somehow had won the copy of the book during one of the workshops. This was over fifteen years ago, and even then, the book wasn’t brand new. “Ethics on the Ark” was written in 1996, and is about to celebrate its 20th anniversary of publication. I feel it’s a great time to revisit this intriguing collection of essays and determine whether this book is still applicable, or if it has become outdated with our advances in animal welfare.

It is heartening that animal welfare has become a discussed topic at conferences, and is being more thoroughly researched and implemented at zoos. But are we due to rewrite some of the chapters of this classic book, or are the topics still relevant today?

Picking out the pertinent and out-dated notions from “Ethics” was actually more difficult than anticipated. Some zoo keepers and even managers still use the book when mentoring or teaching about animal welfare. Others find much of the information not as relevant as it was twenty years ago.

I enjoy visiting zoos wherever I travel, but getting into the nitty gritty details of husbandry practices, ethics, and animal welfare during visits isn’t always appropriate, and such conversations are usually reserved for conferences. After reading the book, revealing both sides of the argument, I think it’s high-time I did start asking some thought-provoking questions, to open up the conversation and let it become a commonplace discussion like enrichment and training often is between zoo keepers.

The editors of “Ethics on the Ark” did a thorough job of including both zoo professionals and critics, to truly see the arguments from all perspectives. It provided some good questions that we can answer ourselves personally, and at least be prepared if/when we are asked these challenging concerns by the public. By delving into the criticisms of zoos, we can discover ways to change and improve our protocols and practices in order to improve the well-being of the animals in our care.

I am of the opinion that each and every animal in a zoo is vitally important to the mission of conservation, whether they be a gorilla, a frog, a flamingo, or a goat. I believe that zoo animals are ambassadors to not just their species, but their natural environment, and other species in which they share their environment. With such crucial roles to play, I feel the most important job of a zoo keeper is to maintain great care and welfare. Our primary position is that of a wellness and welfare protector and provider. Since that is our main focus, should we not look into all available resources to increase our knowledge and improve our skills? Some of the topics within the various essays included zookeeping practices such as enrichment, breeding, and euthanasia. I truly feel the area of enrichment and training have taken off and we are fortunate to have many experienced mentors in our field to continue to advance in these areas. We have also come leaps and bounds in the science of breeding, even within the last twenty years. However, the controversy

that many of the animals bred in zoos will never step foot in their natural environment is a topic that is brought up again and again by zoo critics. And discussing euthanasia seems to still be a hot topic for zoo keepers, even today. This topic is also starting to receive a lot more media attention, perhaps thanks to social media.

From my experiences at zoos, I see the great work being done to strive to be better. The main question posed by “Ethics on the Ark” could potentially be “Is striving to be better enough?”

There have been a great number of advancements in behavioral husbandry and animal welfare since the book was written. In “Defining the Good Zoo”, the definition of enrichment was simple and short. In fact, I wouldn’t consider it much of a definition to our standards anymore. In the essay, enrichment is referred to as “adding one or more items (food or non-food) to an animal’s enclosure.” The authors further point out that the goal is to encourage normal levels of general activity. I don’t necessarily disagree with that assessment, but it’s a far cry from what I believe most zoos do for enrichment in regards to animal welfare. Today we have goal-oriented enrichments. We have behavior plans. We use training to give the animals more choice. I think we could definitely update the area of behavioral husbandry showing how far we have come and continue to grow in the field of giving animals the freedom of choice through training and enrichment.

I found it interesting that “Ethics on the Ark” was written as a result of a conference meeting “Animal Welfare and Conservation: Ethical Paradoxes in Modern Zoos and Aquariums”. How would the contributors feel that in today’s zoos, there are Animal Welfare Committees? In 2012, every AZA institution with elephants participated in one of the most comprehensive research projects dedicated to elephant welfare. Enrichment and exhibit design are monitored and reviewed scientifically, and zoos are establishing positions to focus solely on the welfare and well-being of their animals.

While this book does give voice to the critics of zoos, reading the arguments against captive animals showed me that most of the arguments haven’t really changed, but many of the zoos have. This shows that animal rights activists will probably never change their view and will probably always believe that zoos don’t do enough. I believe that zookeeping is an ever-evolving field, and with our experiences from the past, we can shape a brighter future for our profession, our animals, and their wild counterparts. Using books like “Ethics on the Ark” to draw upon as a resource can help us push boundaries to advance ourselves, and be seen as the pillars of conservation that I see in us already.

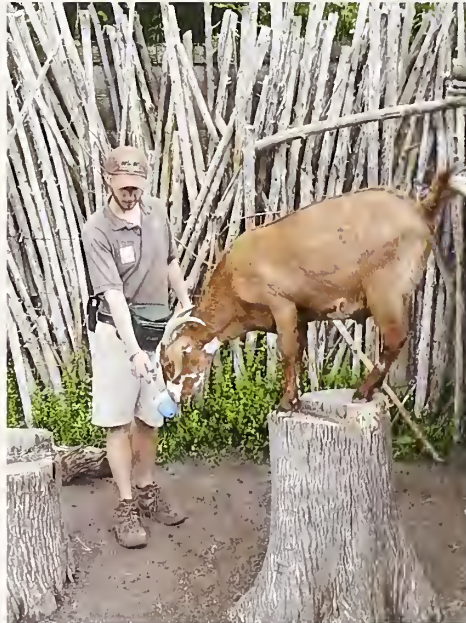
The Behavioral Husbandry Committee recognizes that we are all doing incredible work for animal welfare. Let this not be just a book review and reminder of a resource. Let this be a calling for you to share your experience, strength, and knowledge with the zoo community. We look forward to hearing from you! 🐘

No Goats, No Glory: Developing a Training Program with 2.0 Domestic Boer Goats (*Capra aegagrus hircus*)

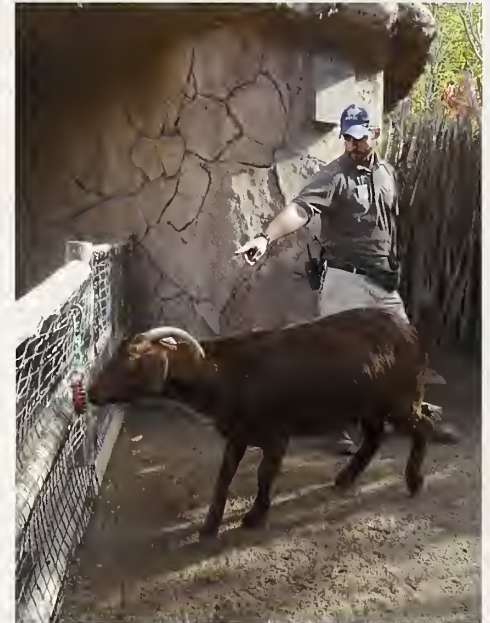
James Weinpress, Elephant Handler
Seneca Park Zoo, Rochester, New York



At almost three-years-old, Peter and Paul are Keeper and guest favorites due to their strong personalities and friendly demeanors. Photo by James Weinpress



The use of the target proved to be beneficial in shaping all of the goats' additional behaviors. Photo by James Weinpress



Asking Paul to go to his station. The station could be placed in different locations throughout the exhibit. Photo by Dan Frick

The Seneca Park Zoo, located in Rochester, New York, completed its 'A Step Into Africa' exhibit in 2012, welcoming guests to a simulated safari experience featuring African elephants (*Loxodonta africana*), olive baboons (*Papio anubis*), African lions (*Panthera leo krugeri*), and domestic Boer goats (*Capra aegagrus hircus*). The zoo made the decision to exhibit goats to educate guests on the importance of livestock to the indigenous people of Tanzania. The goat exhibit sits adjacent to a replica of a Masai hut, where a flat screen TV provides information on the daily lives of the people and their animals.

Born on zoo grounds, the brothers have always enjoyed a positive relationship with their keepers. Despite having no formal training, the goats have regularly taken part in voluntary weights, physical exams by the veterinary and keeper staff, and frequent walks around the zoo via harness and lead. In May of 2015, a formal training plan was created

for the goats to enhance their daily care and increase public interest in the exhibit. Each goat was assigned a primary trainer to ensure consistency between training sessions. Several foods were initially offered as novel training treats, including diced carrots and leafy greens. However, the goats' daily grains proved to be the most reinforcing food for training.

Bridge conditioning, utilizing a clicker, took approximately four to five training sessions to complete, and the goats quickly learned to focus their attention on the trainer. The second step introduced the target pole and calmly following a trainer around the exhibit. Peter and Paul are quick learners, highly food-motivated and very energetic. Both were trained to jump up and balance on tree stumps spread out within their exhibit. These behaviors came naturally to the goats and demonstrated their innate abilities as climbers. The tree stumps were sturdy enough for the animals to jump from one to another, but with a little effort could

be moved around to keep these "obstacle courses" a challenging exercise for them from one week to the next.

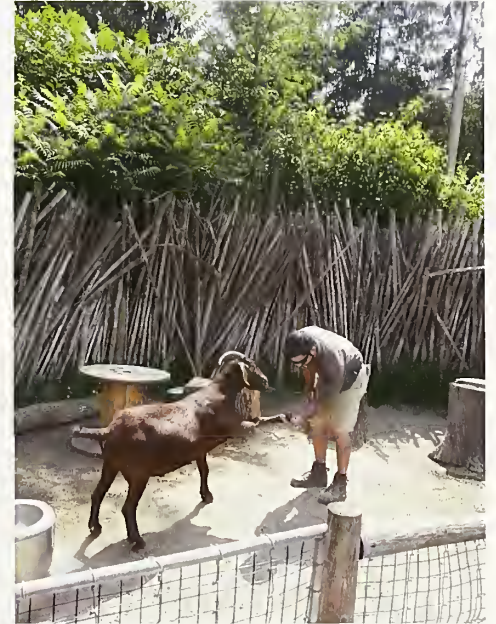
Following the success of these activities, Peter and Paul were introduced to their stations. Training the goats to station to a unique object assisted with separating them at the beginning of each session, which had previously been done by baiting them with food. Asking the animals to station also helped to avoid any aggression exhibited by Paul, who, being the more dominant animal, would frequently attempt to displace Peter as the trainers set up for the session. Training the brothers to station proved to be a challenge at first, as the goats had never been asked to walk away from their trainers to earn reinforcement. Using successive approximations with distance and location of the station and its cue, both boys were eventually successful with stationing.

With several established behaviors under their

In addition to enhancing the goats' lives and educating the public, Peter and Paul have presented great opportunities for new zoo keepers who have never trained animals before.



"Over" photo: Training the goats to jump from stump to stump didn't take long due to their natural inclination to climb in their exhibit. *Photo by James Weinpress*



"Hoof Presentation" photo: Paul allowing his trainer to manipulate and inspect his hoof. *Photo by Dan Frick*

belts, the trainers were then able to move onto a slightly more complex husbandry behavior of hoof presentation. The target pole was used to initiate the goats to lift their feet, and was later replaced with a simple hand gesture. It took only a few well-timed bridges for the two to begin lifting their feet into the trainers' hands on cue. Increasing the duration of time in which the goat allows the trainer to hold and manipulate their hooves, and the introduction of a second person for actual hoof inspection and trimming will be incorporated as the goats become more comfortable with the behavior.

While this training program is still in its infancy, there have already been many positive impacts from its creation. The Zoo's weekly "Goat Experience" educational program has seen an increase in attendance as guests are continuously impressed to see a species not known for its intelligence demonstrate their ability to learn new behaviors. With

an average training session lasting only five minutes, keepers are usually able to conduct one session in a day, which has resulted in an increase of informal training presentations for the public. Guests are able to learn about the benefits of positive reinforcement training and how it pertains to animal care at the zoo, while actively training in front of them.

In addition to enhancing the goats' lives and educating the public, Peter and Paul have presented great opportunities for new zoo keepers who have never trained animals before. The animals' friendly demeanor, paired with a high degree of food motivation, makes them a perfect fit for first time trainers to apply the fundamental principles of operant conditioning directly to training an animal. Thanks to these enthusiastic brothers, goat training at Seneca Park Zoo will surely continue to enhance learning for both humans and animals alike.

Training Update Provided February 26, 2016:

Since writing this article for AKF, both Peter and Paul have made significant progress in their training with a behavioral repertoire of twelve behaviors! This includes a fast spin in both directions and a "wait" behavior that permits the trainer to walk around the exhibit while the goat remains still until bridged. Paul has learned a "hold" behavior that allows for an up-close visual inspection of the face while he rests his chin in the palm of the trainer's hand. The brothers are now comfortable with a second person touching their back and sides as well manipulating their front hooves as part of their physical check-up. Additionally, Paul has learned to blow a "kiss" to Zoo guests by sticking his tongue out which is always a crowd favorite. The goat brothers continue to impress guests and staff alike with their intelligence and motivation to learn.

BHC Comments by Kim Kezer:

It is always fun to read submissions that showcase training of domestic animals. Being that they are domesticated, we often get the impression that they are less “charismatic” than other zoo residents that people come specifically to see, and as a result it is easy to believe that formal behavioral conditioning programs are not necessary. Let’s admit it, it is far more exciting to see you train a hippo rather than, perhaps, a chicken. These animals should not be overlooked, as trainers and animals alike will benefit from utilizing operant conditioning for even the most routine behaviors.

Training programs do not need to be filled with extravagant behaviors, like blood draws and ultrasound; behaviors as basic as “stationing” can have a huge impact for setting up success while training. As mentioned in this Tale, stationing the animals prior to training eliminated the opportunity for one of the goats to “practice” unwanted behaviors (like

being pushy or aggressive) towards the other during the start of a session. Establishing a solid foundation with even the most basic behaviors is essential to the success of a training program.

Domestic animals such as goats, chickens, pigs or horses do offer many learning opportunities for staff as well as enhancing our guest experience. For new and inexperienced trainers, one can learn how to apply training methods with a species that may be more forgiving of our beginning handling errors. For zoo guests, the chance to observe keepers interacting with and training the animals provides us with the opportunity to demonstrate, through positive reinforcement, one of the ways in which we care for the animals. Most guests are surprised to see what the animals are capable of doing.

It is great to see educational programs evolve along with our animal training programs. Consider including your visitors in the program

by having them hold a target from outside the exhibit and teach the animal an “A to B” behavior. Promoting training demonstrations as an educational and interactive experience for our guests guarantees that they will be more engaged and leave, having had a more entertaining, involved experience. Zoos could even look at using domesticated species to teach training skills to our guests, inviting them and leading them through sessions with the animals that enjoy it and are “pros”. This would provide an impactful demonstration of the power of using rewards for basic training that the visitors can then take with them to try on their animals at home.

Thank you for submitting and sharing your Training Tale and may these boys continue to thrive in their training program. 🐐

We want to hear your Training Tales – the good, the bad and the fabulous!

Please submit your “Training Tales” and experiences in operant conditioning to share with *Animal Keepers’ Forum* readers. This opportunity provides a convenient outlet for you to exhibit your training challenges, methods and milestones with the AAZK member network. Please submit entries based on the following guidelines:

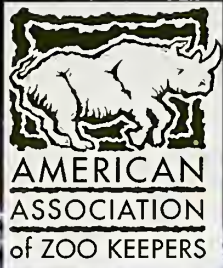
1) Submit a brief description of a training project at your facility. These can be 500 words or less, in text or bullet points – it can be longer (up to 1000 words); however, short and simple descriptions with a few images are just as perfect. Details should include the following:

- ▶ Define the training goal (what did you try to do and for what purpose?)
- ▶ List important steps (How did you do it – include plans that changed along the way/what worked and what didn’t work)
- ▶ Timeline used (how long did it take)
- ▶ Tips you learned along the way

2) Include 3-5 digital photos that clearly depict the animal in the learning process or performing the desired goal (provide photo caption and photographer of each image). Photos need to be 300 dpi and at least 1200 x 1800 pixels.

Please send submissions or questions to:
Kim Kezer at kkezer@zoonewengland.com or
Shane Good at shane.good@aazk.org
(Use *Training Tales Submission* as the subject).





Membership Has Its Benefits!

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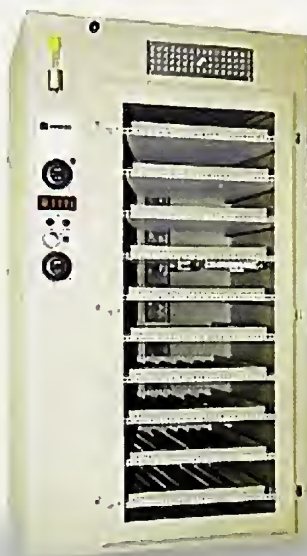
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